Complete Listing of the Claims

1   Claim **1.** (cancelled) A method to determine the best fit parameters of a broadening model to be

2   used to correct for the effects of band broadening in a chromatographic separation containing a

3   separation device followed by two or more detectors comprising the steps of

4   a)   Selecting a broadening model containing a set of adjustable parameters;

5   b)   Injecting a sample containing a monodisperse component;

6   c)   Collecting the signals from each of said detectors corresponding to said monodisperse

7   component;

8   d)   Forming a χ^2 model to be minimized over the peak of said monodisperse component

9   using said collected signal of the most broadened detector signal as a reference against

10   which the said other detector signals are to be broadened;

11   e)   Minimizing the χ^2 model to determine said best fit parameters for each of said detector

12   signals to be broadened so that their broadened and normalized shapes are a best fit to

13   said shape of said detector producing said broadest temporal response.

14

15   Claim **2.** (cancelled) The method of Claim **1** where the minimization of said χ^2 model is

16   achieved by use of a nonlinear least squares algorithm.

17

18   Claim **3.** (cancelled) The method of Claim **2** where said nonlinear least squares algorithm is of

19   the type developed by Marquart.

20

21   Claim **4.** (cancelled) The method of Claim **1** where said χ^2 model to be minimized is

22   $\chi^2_i(\beta_i, \tau_i, \alpha_{ij}) = \int_{peak} \left(D_n(t) - \beta_i \int_{-\infty}^{\infty} D_i(t-\tau) B(\alpha_{ij}, \tau - \tau_i) d\tau \right)^2 dt$, where said best fit parameters

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1   are the β_i, α_{ij}, and τ_i; the i-detectors' responses as a function of time are the $D_i(t)$; and said model

2   is minimized over said peak.

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4   Claim **5.** (cancelled) The method of Claim **1** where said band broadening is caused by dilution.

5

6   Claim **6.** (cancelled) The method of Claim **1** where said broadening is caused by mixing.

7

8   Claim **7.** (cancelled) The method of Claim **6** where said mixing arises from inclusions caused by

9   mechanical defects within the detector cells and/or connectors therefore.

10

11   Claim **8.** (cancelled) The method of Claim **1** where said broadening is caused by internal

12   instrumental effects.

13

14   Claim **9.** (cancelled) The method of Claim **8** where said internal instrumental effects are caused

15   by electronic filtering.

16

17   Claim **10.** (cancelled) The method of Claim **8** where said internal instrumental effects are caused

18   by differences of the sample volume measured by each detector.

19

20   Claim **11.** (withdrawn) A method to derive selected physical properties of a sample passing

21   successively through a set of detectors using a combination of the signals produced by said

22   detectors responding to said sample passing therethrough when some of said detectors exhibit

23   band broadening of their signals, comprising the steps of

1   a) Applying a parameterized broadening function to said detector set to derive thereby a

2   corresponding set of detector signals, all of which have comparable broadening; and

3   b) Using said detector signals now broadened, following application of said broadening

4   function, to derive said selected physical properties of said measured sample.

5

6   Claim **12.** (withdrawn) The method of Claim **11** where said application of said parameterized

7   broadening function is given by $D_i^b(t) = \int_{-\infty}^{\infty} D_i(t-\tau) B\left(\alpha_{ij}',\tau-\tau_i'\right) d\tau$ where $D_i^b(t)$ are the said

8   detector signals now broadened, α_{ij}' and τ_i' are said best fit parameters of Claim **2.**

9

10 Claim **13.** (withdrawn) The method of Claim **11** where said selected physical properties, to be

11 determined from the relation $R(\theta) = K^* M_w cP(\theta)[1-2A_2 M_w cP(\theta)]+O(c^3)$, are the weight

12 averaged molar mass, M_w, and the root mean square radius, r_g, of said sample derived from

13 concentration signals, $c(t)$, and the excess Rayleigh ratios, $R(\theta,t)$, derived from i light scattering

14 signals from a detector set comprised of light scattering detectors, $D_i(t)$, and a dRI detector in

15 sequence, said dRI detector producing a concentration signal exhibiting broadening relative to

16 said light scattering detector signals, where said light scattering detector signals have been

17 broadened.

18

19 Claim **14.** (withdrawn) The method of Claim **11** where said detector signals are from a UV

20 detector followed by a multiangle light scattering detector and said multiangle light scattering

21 signals are broadened.

22

1 Claim **15.** (withdrawn) The method of Claim **11** where said detector signals are from a refractive

2 index detector followed by a viscometer detector and said refractive index detector signals are

3 broadened.

4

5 Claim **16.** (withdrawn) The method of **11** where said broadening function is given by

6 $B(t) = \int_{-\infty}^{\infty} \frac{1}{\sigma\sqrt{2\pi}} e^{-\tau^2/2\sigma^2} \frac{1}{w} U(t-\tau) e^{-(t-\tau)/w} d\tau$, where U(t-$\tau$) =1 when t $\geq \tau$ and =0 when t<τ.

7

8 Claim **17.** (withdrawn) The method of Claim **16** where said optimal parameters of said

9 broadening function have been determined by the method of Claim **1.**

10

11 Claim **18.** (cancelled) A method to determine the delay volumes, τ_i, i = 1 to N-1, between N

12 detectors in a chromatographic separation system using the method of Claim **2.**

13

14 Claim **19.** (new)A method to determine the best fit parameters of a broadening model to be used

15 to correct for the effects of interdetector band broadening in a chromatographic separation

16 containing a separation device followed by two or more detectors comprising the steps of

17   A. Selecting a broadening model containing a set of adjustable parameters;

18   B. Injecting a reference sample;

19   C. Collecting the signals in time corresponding to a peak of uniform composition from each

20   of said detectors of said sample, where a peak is defined as a range of time during which

21   the sample of uniform composition elutes;

22   D. defining the most broadened peak as that corresponding to the peak having the broadest

23   temporal response.

E. Forming a χ^2 model to be minimized over a peak of said sample to be broadened using said collected signal of the most broadened peak as a reference against which the said other detector peaks are to be compared;

$$\chi^2_i\left(\beta_i,\tau_i,\alpha_{ij}\right) = \int_{peak}\left(D_n(t) - \beta_i \int_{-\infty}^{\infty} D_i(t-\tau)B\left(\alpha_{ij},\tau-\tau_i\right)d\tau\right)^2 dt,\ \text{where}$$

(1) said best fit parameters are the β_i, α_{ij}, and τ_i; and

(a) the β_i are scale factors;

(b) the α_{ij} characterize the extent of the broadening, and

(c) the τ_i are the interdetector time delays.

(2) the i-detectors' responses as a function of time are the $D_i(t)$ and said model is minimized over said peak.

F. Minimizing said χ^2 model to determine said best fit parameters for each of said detector peaks to be broadened so that their broadened and normalized shapes are a best fit to said shape of said detector producing said broadest temporal response.

Claim **20**. (new) The method of Claim **19** where the minimization of said model is achieved by use of a nonlinear least squares algorithm.

Claim **21**. (new) The method of Claim **20** where said nonlinear least squares algorithm is of the type developed by Marquardt.

Claim **22**. (new) The method of Claim **19** where said band broadening is caused by dilution.

1   Claim **23**. (new) The method of Claim **19** where said band broadening is caused by mixing.

2

3   Claim **24**. (new) The method of Claim **19** where said band broadening is caused by mechanical

4   defects within the detector cells and/or connectors thereto.

5

6   Claim **25**. (new) The method of Claim **19** where said band broadening is caused by internal

7   instrumental averaging.

8

9   Claim **26**. (new) The method of Claim **25** where said internal instrumental averaging is from

10   electronic filtering.

11

12   Claim **27**. (new) The method of Claim **25** where said internal instrumental averaging is by

13   measuring a range of volumes of the sample.

14

15   Claim **28**. (new) The method of Claim **19** where said peaks of uniform composition correspond

16   to monodisperse fractions which are separated from the other fractions by said chromatographic

17   separation.

18

19   Claim **29**. (new) The method of Claim **19** where said peaks of uniform composition correspond

20   respectively to fractions for which said chromatographic separation device produces no

21   appreciable separation so that said sample elutes with a uniform composition.

22

1   Claim **30**. (new) The method of Claim **19** where said broadening model is given by

2    $B(\alpha_1,\alpha_2,t) = \int_{-\infty}^{\infty} \frac{1}{\alpha_1\sqrt{2\pi}} e^{-\tau^2/2\alpha_1^2} \frac{1}{\alpha_2} U(t-\tau)e^{-(t-\tau)/\alpha_2} d\tau$, where $U(t-\tau) = 1$ when $t \geq \tau$ and

3    $U(t-\tau) = 0$ and $t < \tau$.